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THESIS

**EFFECTS OF DOD ENGAGEMENTS IN
COLLABORATIVE HUMANITARIAN ASSISTANCE**

by

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September 2013

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COLLABORATIVE HUMANITARIAN ASSISTANCE**

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Submitted in partial fulfillment of the
requirements for the degree of

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ABSTRACT

This thesis analyzes long-term effects of Department of Defense Measures of Effectiveness (MOE) and Measures of Performance for Humanitarian Assistance (HA) missions. The Overseas Humanitarian Assistance Shared Information System (OHASIS) is used as the primary data source for HA missions and its associated costs. The thesis centers on HA missions in countries within the Pacific Command Area of Responsibility eligible for HA funding as described in U.S. Code Title X. An assumption of endogeneity is made regarding the data and a Two-Stage Least Squares (2SLS) Fixed Effects model is used as an alternative method to Ordinary Least Squares (OLS) for analysis. The number of bilateral agreements between the U.S. and HA host nations serves as an instrumental variable. The United Nations Human Development Index (HDI) is the MOE. Analysis shows that an OLS model is preferred over a 2SLS for this dataset. The effect of HA expenditures is significant and positive, indicating that increased HA expenditures are associated with higher levels of the HDI. The proportion of population with access to potable water is significantly positively associated with HDI in the model, suggesting that increasing the number of HA water projects might be one strategy for increasing HDI.

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LIST OF ACRONYMS AND ABBREVIATIONS

TCP/IP	Transmission-Control Protocol/Internet Protocol
2SLS	Two Stage Least Squares
AOR	Area of Responsibility
BP	Breusch-Pagan
COCOM	Combatant Command
COMPACT	Compact of Free Association
DoD	Department of Defense
EM-DAT	International Disaster Database
FACTS	Foreign Assistance Coordination and Tracking System
FE	Fixed Effects
GAO	Government Accountability Office
GDP	Gross Domestic Product
GNI	Gross National Income
GTD	Global Terrorism Database
HA	Humanitarian Assistance
HCA	Humanitarian Civic Assistance
HDI	Human Development Index
HN	Host Nation
IAM	International Assistance Mission
ICRC	International Committee of the Red Cross
MCC	Millennium Challenge Cooperation
MOE	Measure of Effectiveness
MOP	Measure of Performance
MSF	Médecins Sans Frontières
MUA	Mutual Understanding Agreement
NGO	Non-Governmental Organization
NSS	National Security Strategy
OHASIS	Overseas Humanitarian Assistance Shared Information System
OHDACA	Overseas Humanitarian, Disaster Assistance, and Civic Aid
OLS	Ordinary Least Squares

PACFLT	United States Pacific Fleet
PACOM	United States Pacific Command
PEPFAR	President's Emergency Plan for AIDS Relief
SOFA	Status of Forces Agreement
TSC	Theater Security Cooperation
TSCMIS	Theater Security Cooperation Management Information System
U.S.C.	United States Code
UN	United Nations
UNDP	United Nations Development Programme
U.S.	United States
USAID	United States Agency for International Aid
USNS	United States Naval Ship

EXECUTIVE SUMMARY

Since 2006, Combatant Commands have used Department of Defense (DoD) Directive 3000.15 and the National Security Strategy (NSS) to form large-scale annual Humanitarian Assistance (HA) missions like Pacific Partnership, which utilizes one of the United States Naval Ship (USNS) hospital vessels, in even years, and an U.S. amphibious vessel in odd years, to engage in HA missions worldwide. Many meetings have occurred among the State Department, the DoD, and Non-Governmental Organizations (NGOs) to find an appropriate role for the DoD in this effort. It has to be understood that U.S. DoD HA efforts cannot only have an altruistic humanitarian purpose because of U.S.C. Title X restrictions. Quantifiable Measure of Effectiveness (MOE) and Measures of Performance (MOPs) must be in place for the DoD to engage in these efforts.

Trying to capture long-terms effects of HA DoD is a relatively new development. With DoD HA, a presumed inherent selection bias exists that is associated with each mission because in theory, each mission is supposed to be selectively chosen and have a strategic objective. This bias often causes correlation between a MOE (response variable) and its associated MOPs (regressor variables) due to the outcome desired by the DoD, which is primarily focused on capacity building. Statistical tools other than Ordinary Least Squares (OLS) regression are required to account and test adequately for the selection bias when trying to capture the effects on HA missions to a particular MOE. Several economists have tried to address the issue of long-term U.S. aid and growth by using an econometric model called Two-Stage Least Squares Regression (2SLS).

The United Nations Human Development Index (HDI) is the MOE. The HDI is a single statistical resource for researchers trying to quantify DoD HA events. This index satisfies one of the primary goals of DoD HA, which includes capacity building with partner nations. The final dataset has 147 observations in 23 of the 26 Title X eligible countries using aggregate DoD HA engagement missions from 993 missions from 2006–2012.

The results suggest that an OLS model is preferred over a 2SLS model for this dataset. The HA expenditures are significant and positive, which indicates that increased HA expenditures are associated with higher values of the HDI, and thus validates U.S. efforts in HA by having a marginal positive impact on improving the HDI in developing nations. These HA missions in the Pacific Command Area of Responsibility (PACOM AOR) fall in line with part of the goals of the NSS, which is for the U.S. to strengthen partnerships and improve the overall state of developing nations. Also, increasing HA water/sanitation projects can be associated with higher HDI levels since the proportion of population to potable water was one of the most positive impacts to the HDI.

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I. INTRODUCTION

A. THESIS PURPOSE

The purpose of this thesis is to provide concrete tools to measure Department of Defense (DoD) Measure of Effectiveness/Measures of Performance (MOE/MOPs) for Humanitarian Assistance (HA) missions and to ascertain if an effective method exists to determine if DoD engagement in HA missions is in accordance with the National Security Strategy (NSS). The thesis centers on HA missions in countries within the U.S. Pacific Command Area of Responsibility (PACOM AOR) eligible for HA funding as described in U.S.C. Title 10 (LCDR Jerry Tzeng PACFLT Foreign Humanitarian Assistance Officer, personal communication, May 2, 2013). Data from this thesis come from the United Nations Human Development Index (UN HDI), Overseas Humanitarian Assistance Shared Information System (OHASIS), International Disaster Database (EM-DAT), World Bank, Global Terrorism Database, Foreign Assistance Database, State Department, and Congressional reporting resources.

B. THESIS OBJECTIVES

- Create an empirical model to see if U.S. DoD HA engagement in HA missions over a period of time (2006–2012) is associated with improvements in a country's HDI index. One of the U.S.'s major goals for performing HA missions is to increase the capacity of a respective country to the point at which it can improve its way of life and become less dependent on foreign assistance.
- Provide a streamlined view of DoD involvement in HA missions
- Utilize the OHASIS database for academic research for one of the first times

C. BACKGROUND

On November 28, 2005, DoD Directive 3000.05 was released, which mandated that stability operations would be “given priority comparable to combat operations and be explicitly addressed and integrated across all DoD activities including doctrine, organizations, training, education, exercises, materiel, leadership, facilities, and planning” (Department of Defense, 2005, p.2). Over the past several years, since the DoD

has rapidly increased the number and scale of HA missions, communication issues over the basic definition of HA has created confusion with the State Department and Non-Governmental Organizations (NGOs) with similar HA missions. The DoD conducts hundreds of HA missions a year ranging from large-scale efforts, such as the Pacific Partnership and Continuing Promise to smaller missions like U.S. Navy Seabees who help build roads and bridges in foreign countries. According to a report from the Kaiser Family Foundation(Henry J. Kaiser Family Foundation, 2012), the DoD has “a unique ability to aid the State Department in HA missions due to its ability to rapidly mobilize assets and its long-standing partnerships with governments and militaries worldwide”(p.1). The DoD is legally allowed to conduct HA missions in accordance with the United States Code (U.S.C.) Title 10 Section 401, which states:

Under regulations prescribed by the Secretary of Defense, the Secretary of a military department may carry out humanitarian and civic assistance activities in conjunction with authorized military operations of the armed forces in a country if the Secretary concerned determines that the activities will promote

(A) the security interests of both the U.S. and the country in which the activities are to be carried out; and

(B) the specific operational readiness skills of the members of the armed forces who participate in the activities. (U.S.C. Title 10 Section 401)

DoD HA missions are often construed and interpreted by the NGOs and the State Department as referring to development assistance, which is the primary mission of the State Department. It is against DoD policy to commit funds for this type of assistance (U.S.C. Title 10 Section 401). The State Department has a broader range of authority to conduct HA missions than the DoD, and conducts them under the name of development assistance. The United States Agency for International Aid (USAID) is the lead development agency for the U.S. and is charged with conducting U.S. foreign policy by “promoting broad-scale human progress at the same time it expands stable, free societies, creates markets and trade partners for the U.S., and fosters good will abroad” (USAID, 2013). The State Department and DoD will sometimes work together with NGOs whose HA end goals do not align with the USAID charter and/or DoD Area of Responsibility

(AOR) strategic objectives because the NGOs are not affiliated with any official state or religious entities. To ease this confusion between HA definitions, academic scholars have tried to derive terms to describe the different type of assistance that organizations provide and the purpose for conducting these missions.

Civilian NGOs, such as the International Committee of the Red Cross (ICRC) and Médecins Sans Frontières (MSF), also known in the U.S. as Doctors Without Borders, believe in what Michael Barnett (2011) calls an “Emergency Aid” view of humanitarianism, which is considered the traditional view of humanitarianism that uses the four guiding principles as described by the United Nations Office of Coordination of Humanitarian Affairs, the leading United Nations agency dedicated to HA (United Nations Office for Coordination of Humanitarian Affairs, 2010).

- Humanity—End human suffering
- Neutrality—Do not take sides in hostilities
- Impartiality—Aid should be based on needs alone, regardless of race, class, gender, and sex
- Independence—Humanitarian aid should be autonomous from benefactors and institutional donors

These organizations operate in war zones and provide aid to whoever qualifies for assistance based on the aforementioned four principles regardless of combatant status. The MSF provided humanitarian assistance to the Taliban in Afghanistan during Operation Enduring Freedom. In August 2010, 10 aid workers from the International Assistance Mission (IAM) were killed in a remote village in Afghanistan by Taliban forces. Instead of leaving the area, this NGO talked to local tribal leaders to attain their assurance of providing a safe environment for their aid workers and continued to provide HA in the area (Rabkin, 2010).

The DoD takes Barnett’s other humanitarian view, the “Alchemist” approach of HA, which is to “not only focus on symptoms of humanitarian disasters, but tries to remove the root cause of suffering” (Barnett, 2011). The Alchemic approach is inconsistent with the “Emergency Aid” approach because options, such as the use of military force to resolve HA issues, will be considered. Also, advancement of self-interest, as well as the interest of the countries receiving assistance, will be factored into

whether assistance will be provided to a particular country (Barnett, 2011). From the DoD's point of view, every HA mission must produce an overall benefit to U.S. interest. Some NGOs are even hesitant to participate with the DoD in HA missions because of the belief they will lose their neutrality when continuing to provide aid in countries long after the DoD has left the area. Former Secretary of State Colin Powell angered some NGOs when he called them a "force multiplier" and a part of the "combat team" (Powell, 2001). It is important to understand these differences to determine how the DoD can provide a supporting role in HA while achieving national security interests.

Since 2006, combatant commands (COCOMS) have used DoD Directive 3000.15 and the NSS to form large-scale annual HA missions, such as the Pacific Partnership. This mission utilizes one of the United States Naval Ship (USNS) hospital ships, like the one shown in Figure 1, in even years and a U.S. amphibious vessel in odd years, to engage in HA missions worldwide.



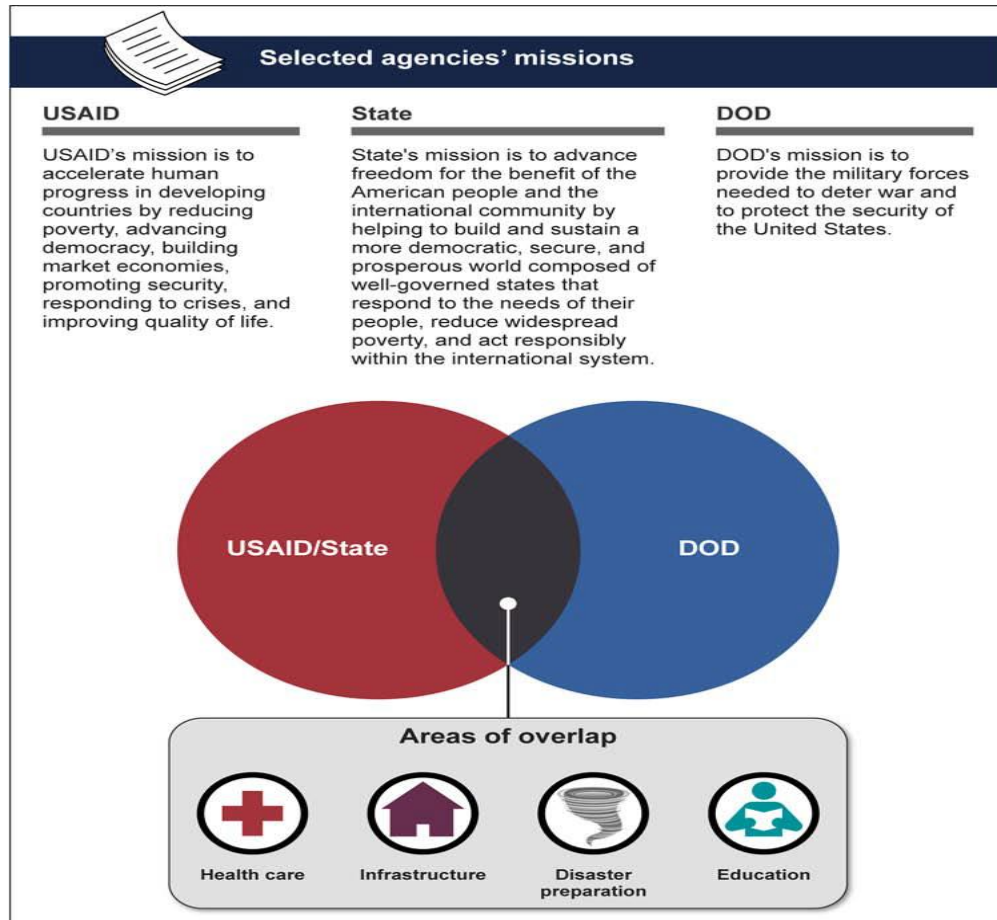
Figure 1. USNS MERCY. A Primary Symbol of DoD Humanitarian Assistance (From Maritime Quest, 2006).

Many meetings have occurred among the State Department, the DoD, and NGOs to find an appropriate role for the DoD in this effort. It has to be understood that U.S.

DoD HA efforts cannot only have an altruistic humanitarian view. Some measurable MOE/MOPs must be in place for the DoD to engage in these efforts. All entities working with the DoD must understand end-state goals before DoD resources are committed to prevent confusion when collaborative HA missions begin. Major questions have arisen when trying to measure “success” in DoD HA missions over the past several years. What is the best way to measure “partnership”? How will U.S. efforts be surmised as having been working? How are strategic long-term objectives sustained with DoD HA missions? How is success measured? For the purposes of this thesis, “success” is measured in terms of the change in the HDI, a measure developed by the United Nations Development Project (UNDP) as a way to measure countries’ overall level of human development, rather than using the Gross Domestic Product (GDP) alone (Human Development Report, 2011).

D. CHALLENGES TO CURRENT DOD HA ASSESSMENTS

Since the increase in DoD HA missions following the successful military humanitarian intervention in East Asia after the 2004 Tsunami, there has been a push to ensure that DoD involvement in HA events is actually having an positive impact on host nation (HN) recipients. Several published reports have addressed some of the difficulties in measuring DoD HA MOEs. In February 2012, the Government Accountability Office (GAO) released a report concerning DoD HA activities and made recommendations for better long-term evaluations (U.S. Government Accountability Office, 2012). This report concluded that significant problems had occurred with the development of MOEs that began with fundamental issues pertaining to how missions were being chosen and the role of the DoD and State Department in various HA missions. Possible overlap between the DoD and State Department in conducting missions is shown in Figure 2.



Source: GAO analysis of DOD and USAID data.

Figure 2. Possible areas of overlap between the DoD and State Department (From U.S. Government Accountability Office, 2012)

Another issue with measuring and evaluating DoD missions is the prevalence of data. Several databases track HA missions between the State Department and the DoD. All these databases are separate as shown in Table 1, which adds to the lack of transparency of HA missions worldwide among the government agencies.

Information-sharing initiative	Goals	Lead agency	Participating agencies	Intended audience
Foreign Assistance Dashboard	Collect and provide all U.S. government foreign assistance information in a standard, accessible, and easy-to-use format	Initiative directed by the National Security Council and implemented by State and United States Agency for International Aid (USAID)	Currently limited to State, USAID, and the Millennium Challenge Corporation	General public, foreign nations, Congress, U.S. government agencies, and donors
Foreign Assistance Coordination and Tracking System (FACTS Info)^a	Collect and report data on U.S. President's Emergency Plan for AIDS Relief (PEPFAR) foreign assistance funding for HIV/AIDS	State and USAID	All PEPFAR implementing agencies	Currently limited to PEPFAR implementing agencies, with the intent to share information with all FACTS Info users
Overseas Humanitarian Assistance Shared Information System (OHASIS)	Manage the life cycle of DoD's Overseas Humanitarian, Disaster Assistance, and Civic Aid (OHDACA)-funded and Humanitarian Civic Assistance (HCA) humanitarian assistance projects	DoD	DoD supplies project data; State and USAID have access to review data	DoD and U.S. government agencies
Global Theater Security Cooperation Management Information System (TSCMIS)	Link all of the combatant commands' and DoD components' security cooperation efforts in one system	DoD	Initially limited to DoD	Initially to be an internal database for DoD, with the intent to share information across all interagency partners
Foreign Assistance Database	Compile and report U.S. foreign assistance data annually	USAID	19 agencies	Donor countries from the Development Assistance Committee of the Organization for Economic Cooperation and Development; the database is also available to the general public

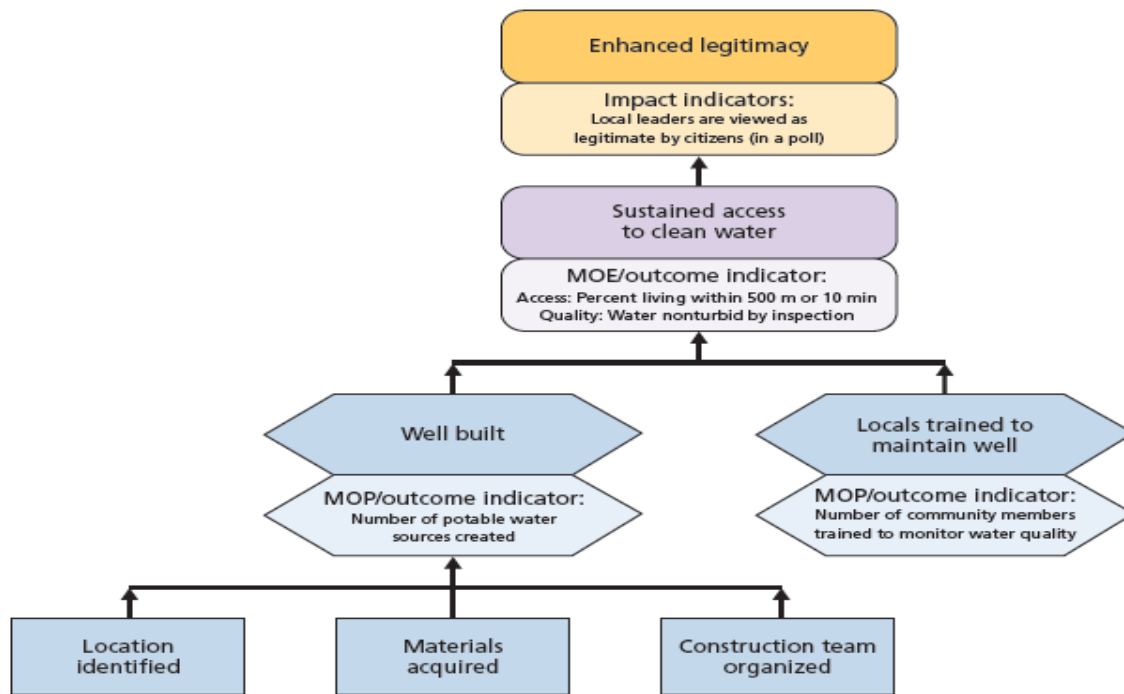
Table 1. Various Dedicated HA Databases and Intended Audiences (From U.S. Government Accountability Office, 2012)

All DoD HA missions are supposed to be in line with the strategic goals outlined in OHADACA policy objectives, which were to do the following (Haims, Moore, Green, & Clapp-Wincek, 2011).

- Increase military access to the community and country
- Improve military influence in the community
- Increase the legitimacy of local officials in the eyes of the community
- Create a better public image of America, particularly the U.S. military

The short-term effects have begun to be captured by respective COCOMS via site surveys and assessments. However, the long-term sustainment is a relatively new area of study. The Rand Corp created a prototype handbook in 2011 to address the issue of refining the ways to ensure DoD objectives are being met (Haims et al., 2011). The major emphasis was trying to get HA planners to tie each DoD HA mission to an overall strategic goal and objective, and recommending the DoD mandate these procedures for all future HA missions. The Rand report utilized an MOE/MOP “objective tree” as a tool to assist HA planners meet the strategic objectives as shown in Figure 3. Due to the broad scope of DoD strategic goals, it can be difficult to create proper MOEs that will correctly assess whether DoD HA missions are being effective.

MOPs and MOEs Associated with the Objective Tree in the Well-Building Example



RAND TR784-2.8

Figure 3. Example of RAND HA Objective Tree Source (From Haims et al., 2011)

E. ORGANIZATION OF THE STUDY

Chapter II provides a review of previous studies of measuring HA MOEs. Chapter III describes the data variables. Chapter IV discusses the methodology used, which includes an overview of the two-stage least squares model and results of the analysis. Chapter V covers the summary, recommendations, and future work.

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II. LITERATURE REVIEW

Trying to capture long-terms effects of HA DoD is a relatively new development. With DoD HA, an inherent selection bias is associated with each mission because in theory, each mission is supposed to be selectively chosen and have a strategic objective. This bias often causes a correlation between an MOE (response variable) and its associated MOPs (regressor variables) due to the outcome desired by the DoD, which is primarily focused on capacity building. Statistically, DoD selection bias causes Ordinary Least Squares (OLS) regression to be invalid due to the correlations between parameter and the error term. This phenomenon is known as endogeneity. Many factors are considered when planning missions to ensure they achieve DoD strategic goals. Statistical tools other than OLS regression are required to account for the selection bias adequately when trying to capture the effects on HA missions to a particular MOE. Several economists have tried to address the long-term issue of U.S. aid and growth by using an econometric model called Two-Stage Least Squares Regression (2SLS).

A. BURNSIDE AND DOLLAR

Burnside and Dollar (2010) uses a 2SLS in their research when they examined a World Bank foreign aid database to determine relationships between foreign aid, economic policies, and growth per capita GDP. Their research concludes that U.S. foreign aid had a positive impact in developing nations with good fiscal policies and little effect in nations with poor economic policies (p. 847).

B. EASTERLY

Other economists, such as William Easterly, disagree with Burnside and Dollar's conclusions about foreign aid and growth. Easterly, Levine, and Roodman (2003) conducted research on aid and growth using the same methodology as Burnside and Dollar but added more data. They used World Bank data up to 1997, as opposed to the 1993 data used by Burnside and Dollar. They also filled in missing country data from 1970 to 1973 (Easterly, et al., 2003). Due to a more robust data set, these authors concluded a reduction of confidence should occur with Burnside and Dollar's

conclusions regarding a strong positive interaction between foreign aid and economic growth, since their data shows no statistical significance between the interactions of these two factors (Easterly et al., 2003, p. 6). Easterly et al. (2003) specifically puts in their paper that they are not saying that aid is ineffective, but more research is needed in this field of research (p. 6).

C. MAJOR

Major (2013) has written about the use of 2SLS for DoD HA missions. Dr. Major stresses the importance of using 2SLS in cases of HA by using an example, such as asking the question “does police presence reduce crime?” An expectation of this model is that when the number of police officers is increased, the crime response variable is decreased, but since police are normally sent to high crime areas, a relationship between police and crime results. Using an OLS model would suggest that more police are associated with higher crime levels. The selection bias is causing the endogeneity, and pertaining to a U.S. DoD mission, a similar problem possibly exists because the DoD does not pick missions at random but rather takes many factors into consideration to meet its strategic objectives.

Major (2012) also employs a 2SLS model with the TSCMIS database. Unlike OHASIS, which records only HA events, the TSCMIS database is a record of all events relating to meeting the strategic goals of all combatant commands from foreign military sales to HA events. Major uses the entire unclassified TSCMIS database to determine if Theater Security Cooperation (TSC) activities were having an impact on countries the UN General Assembly votes in the U.S.’ favor. His research concluded that TSC events had a positive impact by shifting countries’ UN voting preferences towards the United States. However, the TSC events caused an increase in violence in countries. He hypothesized that this violence could be caused by TSC events that could be empowering countries to combat violent activities but more research is needed to confirm this hypothesis (Major, 2012).

While Major only considers the soft power benefits (HA HN's favorable UN votes) to the United States, this thesis, like development economists Easterly, Burnside and Dollar, focuses on the overall development of HN that receive U.S. assistance, in particular, DoD HA assistance.

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III. METHODOLOGY

A. INTRODUCTION

This chapter details data sources, response and independent variables, and simple descriptive statistics about the data collected.

B. PRIMARY DATABASE

The data used in the following analysis are primarily drawn from the Overseas Humanitarian Shared Information System (OHASIS). This dataset is maintained by the Army Geospatial Center. OHASIS is the primary tool viewed by the DoD and State Department officials to de-conflict similar HA events between the departments. Aspects of this dataset include the latitudes and longitudes of tentative HA events, estimated cost, and a detailed description of the particular event. This dataset is also used as an official tool to report HA events to Congress (U.S. Government Accountability Office, 2012). The funding source for all HA events in OHASIS come from the Overseas Humanitarian, Disaster Assistance, and Civic Aid fund, which is overseen by the Defense Security Cooperation Agency (U.S. Government Accountability Office, 2012). The OHASIS database is partitioned by Combatant Command AOR. All data used for this thesis was used with the PACOM OHASIS data only to ascertain if MOEs could be constructed from data from a particular AOR.

According to the database collected on May 14, 2013, 3,564 HA events occurred in the years 2006–2012 between the OHASIS version 1.0 and version 2.0 databases. Several HA missions overlapped between the databases as a full conversion to the new OHASIS database is currently taking place.

C. TRIMMING DATA

Of the 3,564 events of potential interest, only 214 events were indicated as “complete” by the personnel conducting the HA missions in the respective countries. After discussion with technical OHASIS representatives at the Army Geospatial Center and the PACFLT Humanitarian Assistance Officer, it was decided to assume that

additional events indicated as "late", "approved" by DSCA or "funded" were complete and include them in the dataset, which increased the number of completed events to 993. Since it is not possible to determine if the other remaining events were completed, they were not included in this research (Steven Benzek, personal communication, April 24, 2013; LCDR Tzeng (Foreign Humanitarian Assistance Officer, PACFLT), personal communication, May 2, 2013). Other events not included were those that included paying for personnel to attend conferences events that did not occur in sovereign countries. The HDI is only calculated by the UNDP for UN member states.

D. RESPONSE VARIABLE HUMAN DEVELOPMENT INDEX (HDI INDEX)

The HDI index is a single statistical resource for researchers trying to quantify DoD HA events. This index satisfies one of the primary goals of DoD HA, which includes capacity building with partner nations. In the U.S.C., DoD HA events are defined as (U.S.C. Title X):

- (1) Medical, surgical, dental, and veterinary care provided in areas of a country that are rural or are underserved by medical, surgical, dental, and veterinary professionals, respectively, including education, training, and technical assistance related to the care provided.
- (2) Construction of rudimentary surface transportation systems.
- (3) Well drilling and construction of basic sanitation facilities.
- (4) Rudimentary construction and repair of public facilities.

The HDI was created by Mahbub ul Haq, a Pakistani economist, who wanted to shift the focus of gauging human behavior and development to people and their capabilities rather than using purely economic measures of effectiveness (Human Development Report Office (HDRO), Human Development Reports, n.d.). Prior to 2011, the HDI index was comprised of the following three dimensions (Human Development Report Office (HDRO), Human Development Reports, 2007/2008). (1) health dimension—life expectancy at birth, as an index of population health and longevity, (2) knowledge and education, as measured by the adult literacy rate (with two-thirds weighting), and the combined primary, secondary, and tertiary gross enrollment ratio

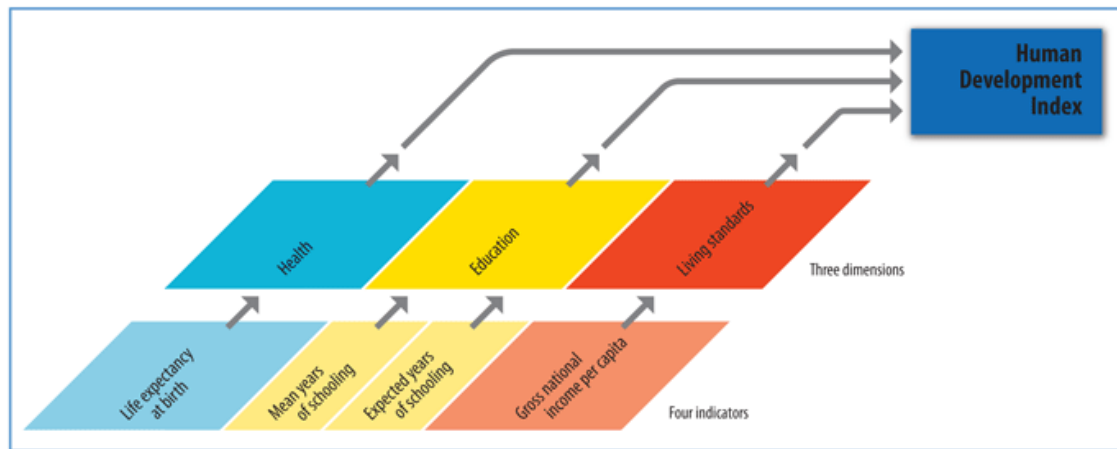
(with one-third weighting), and (3) standard of living, as indicated by the natural logarithm of gross domestic product per capita at purchasing power parity.

An index is created for each of these dimensions. The overall HDI was calculated using an arithmetic mean of the indices for the three dimensions and the results are given on a scale from 0 to 1. In 2011, the UNDP formulated new metrics for the HDI index. Major changes to the index involved modifications to the education and living standards dimensions. The education dimension now uses indicators of mean years of schooling and expected year of schooling. The income dimension is now measured in terms of the Gross National Per Capita Income (GNI) rather than the previous Gross Domestic Product (GDP). Finally, the overall HDI index is calculated with a geometric mean rather than an arithmetic mean (Human Development Report Office (HDRO), Human Development Reports, n.d.b.). Figure 2 shows a diagram of the structure of the new HDI index. This index has the capability to capture all these aspects of legally allowed DoD HA events. The indicators within the HDI, such as health, education, and income factors, can be used separately in their respective index or as the aggregate HDI index.

The HDI partitions countries into categories of development as “very high,” “high,” “medium,” and “low. These categories are constructed by placing the countries into four quartiles based on their HDI (Human Development Report Office (HDRO), Human Development Reports, n.d.c.).

Components of the Human Development Index

The HDI—three dimensions and four indicators



Note: The indicators presented in this figure follow the new methodology, as defined in box 1.2.

Source: HDRO.

Figure 4. Current Human Development Index Components (From Human Development Report Office (HDRO), Human Development Reports, n.d.b.)

E. INDEPENDENT VARIABLES

1. OHASIS Variable

In the original OHASIS dataset, 79 columns listed data for each event. For this research, the OHASIS variable is one observation representing the annual estimated costs of all events for a specific country. Since the data were not available for approximately 5 percent of the estimated costs, these values were approximated based on similar types of events within the country. All other variables were added using a compilation of other data sources.

The final dataset has 147 observations in 23 of the 26 Title X eligible countries. The countries are Bangladesh, Cambodia, Fiji, India, Indonesia, Kiribati, Laos, Malaysia, Maldives, Micronesia, Mongolia, Nepal, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Timor-Leste, Tonga, Vanuatu, and Vietnam. The remaining Title X eligible countries of Marshall Islands, Nauru, and Tuvalu, were not

included because of insufficient HDI data. Thirty observations have “0” dollars as the cost since an HA event was not conducted in one of the countries of interest during the time of interest. These 147 observations comprise 993 HA events.

2. GDP Per Capita FY12 Constant Dollars

GDP Per Capita is a continuous variable from the World Bank database (World Bank, The, n.d.) in constant FY12 dollars. The DoD is only allowed to provided assistance and use its HA funds for nations that are “developing” according to the World Bank List of Economies (LCDR Tzeng (Foreign Humanitarian Assistance Officer, PACFLT), personal communication, May 9, 2013). The GDP Per Capita ranged from \$324.92 (Nepal, 2006) to \$ 11,005 (Palau, 2012). The average GDP Per Capita for all observations was \$2,979. Countries with low GDP Per Capita should have a negative effect on the HDI. Increased U.S. DoD HA involvement should increase the GPD Per Capita by improving the HN capacity especially in the areas of infrastructure and health, thereby increasing the HDI.

3. Defense Treaties

This variable is categorical with names NONE, SOFA, MUA, or COMPACT. Variable data come from a report from the Congressional Research Service (Mason, 2012). The aforementioned Treaties in Force document was used as the data source for the Congressional Research Service report. Of the 23 countries of interest, nine do not have a SOFA/MUA/COMPACT agreement (Cambodia, Fiji, India, Indonesia, Kiribati, Laos, Nepal, Vanuatu, and Vietnam).

4. Population/EM-DAT (Number of People Affected)

The population variable is data from the World Bank (World Bank, The, n.d.).

The Emergency Events Database (EM-DAT) was created in 1988 by the Belgian government and the World Health Organization as a tool to be used to measure disaster occurrences. This database has information covering the number of people affected and killed by over 18,000 mass disasters since 1900 (EM-DAT, n.d.). With respect to the HDI, countries with a higher number of people affected by natural disasters should have a

negative effect on the HDI. Increased U.S. DoD HA involvement should decrease personnel affected by events by improving HN capacity dealing with disaster mitigation; thereby, increasing the HDI.

5. USAID/MCC Per Capita Funding FY12 Constant Dollars

This variable is a collection of data from the Foreign Assistance Database (ForeignAssistance.gov, n.d.). This variable is constructed using only those monies distributed in FY12, rather than the funding obligated. The USAID and Millennium Challenge Cooperation (MCC) funding are two types of funding. The primary difference between the two organizations is that the MCC has a more stringent selection criterion for aid than USAID. MCC participating countries must meet specific criteria to receive funding. If a country is already receiving funding, but fails to score proficiently on one of the criteria, it is placed in a ‘threshold’ status and its funding is reduced (Millennium Challenge Corporation, n.d.). The USAID has fewer set guidelines for funding except that the money is used to promote the long-term strategic goal of the U.S. (USAID, 2013). Countries with lower USAID/MCC funding should have a negative effect on the HDI. Increased U.S. DoD HA involvement events would also augment State Department funding.

6. Arable Land Percentage

This variable was a collection of data concerning the percentage of land available for agriculture growth. Information is from the World Bank database (World Bank, The, n.d.). All events after 2011 are recorded with the 2011 datapoint.

7. Potable Water Percentage

This variable was a collection of data concerning the percentage of land available for agriculture growth. Information is from the World Bank database (World Bank, The, n.d.). The latest potable water percentage is from 2010. All events after 2010 are recorded with the 2010 datapoint.

8. Terror Events

It is clear from a review of each HA event's detailed description that most HA events are geared toward the reduction of terrorist activity by providing the local population with the HA centers of gravity (food, water, shelter, and education). The Global Terrorism Database was used to collect aggregate totals of terror events (Global Terrorism Database, n.d.) for the countries and years of interest. Countries with higher terror events should have a negative effect on the HDI. Increased U.S. DoD HA involvement should decrease terror events by improving the HN population's trust in the government and building capacity; thereby, increasing the HDI.

9. Bilateral Agreements (Instrumental Variable)

This variable is a collection of data from the State Department Treaties in Force 2012 document (Department of State, n.d.). This information was not in any organized database and had to be gathered by hand by reviewing each country and counting the number of bilateral agreements by the year the treaty was placed in force. The bilateral agreements range from three (Vanuatu) to 112 (Philippines). The average number of bilateral agreements is 28.

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IV. ANALYSIS

A. INTRODUCTION

This chapter provides results for the 2SLS Fixed Effects (FE) model for DoD HA engagements. First, an explanation of the 2SLS FE model and instrumental variables is presented, followed by an analysis of the model. The chapter concludes with a comparison of the 2SLS FE model and OLS FE model followed by a chapter summary.

B. ANALYTICAL METHOD AND ANALYSIS

The proposed model has two parts (equations 1a and 1b). Terms are indexed by i for country and t for time.

Model

1st Stage

$$OHASISCost_{i,t-1} = insv_{t-1} + x_{t-1} + \varepsilon_{t-1} \quad (1a)$$

2nd Stage

$$HDI_{it} = OHASISCOST_{i,t-1} + x_t + \mu_t \quad (1b)$$

The terms of the model are below.

OHASISCost:	The yearly budget for (all) humanitarian missions for the i th country in the PACOM AOR as reported in the OHASIS dataset.
insv:	A vector of instrumental variables that predict U.S. DoD HA engagement within the PACOM AOR for the i th country in the t th year in the PACOM AOR; these variables should be uncorrelated with HDI. ‘Bilateral Agreements’ is the instrumental variable.
HDI:	A variable that measures the overall human development in the i th country in the t th year. It is a continuous variable with a range of 0–1.
x :	A vector of control variables (e.g., natural disasters, as reported in the EM-MAT dataset, GDP per capita, population size, etc.).
ε_{t-1}	Disturbance term for unexplained variance from 1st stage
μ_t	Disturbance term for unexplained variance from 2nd stage

In words, the OHASIS cost at a particular time period is a function of the instrumental and control variables; the HDI depends on the previous year's OHASIS costs, as well as the same control variables from the first stage.

There are two assumptions of the OLS model that are potentially violated with this thesis data and are addressed by other statistical means.

One potential OLS assumption violation pertains to the randomness associated with the regressor variables. The "OHASISCost" variable is not random due to the HA planning process. Every DoD HA mission is supposed to be carefully chosen and have a strategic outcome. Another OLS assumption is that the regressor variables are uncorrelated with the error term, which could contain unobserved terms. This may be violated with the "OHASISCost" variable. In the case of DoD engagements and human development, many factors likely arise other than those specified in an OLS model, such as the U.S. strategic relationship with HN countries in the form of bilateral agreements. These other factors could indicate a relationship between the specified parameters (USAIDPerCapita, DefenseTreaties, etc.) and the response variable due to the DoD's attempt to have a positive impact on human development with every HA mission. In the econometrics community, these OLS violation issues are referred to as endogeneity. For this thesis, the "OHASISCost" is the endogenous variable, since the selections of missions are designed to improve human development, which is the primary purpose of the HDI.

To account for these potential OLS violations, a 2SLS FE model was used. Fixed effects were used in the model since this thesis deals with panel data and an assumption was made that there are relationships among the observations across the countries, years or both. The PLM Test in the 'PLM' package (Croissant & Millo, 2008, pp. 1–43) was used to decide which fixed effect variable would be used. The PLM test incorporates the Breusch-Pagan (BP) test, which tests for heteroscedasticity in panel data using Lagrange Multipliers. The null hypothesis for the BP test is that homoscedasticity is present (Breusch & Pagan, 1979, p. 1288). Each fixed effect, "CountryName," "FiscalYear," and the combined effect of both variables, was used separately in the 2SLS model for the PLM Test. The 2SLS model with "FiscalYear" fixed effect was the only model was the

only model that had a p-value under which the BP test null hypothesis was not rejected; that was the model chosen to use.

A 2SLS uses instrumental variables to correct for these violations but introduces a variable correlated with the endogenous variable (for this thesis, the OHASISCost variable), which, to the extent possible, is not correlated with the ultimate response term, the HDI. The process by which the U.S. selects its aid-targets with the instrumental variable “Bilateral Agreements” is selected as the instrumental variable. Doing so makes it possible to control for the endogeneity that would otherwise confound the relationship between the humanitarian assistance engagements (OHASIS) and the quality of life in partner/recipient countries (HDI). Given the strong alliances the U.S. intends to maintain and build in the PACOM AOR, it is suspected that the more bilateral agreements the U.S. has, the more it would try to focus its missions to strengthen partnerships in the region. On the other hand, little reason exists to suspect that countries’ quality of life (HDI, the response variable from the 2nd stage equation), would be related to bilateral agreements.

It was determined that the “BilateralAgreements” variable was the best one to use as an instrumental variable since the correlation between the endogenous variable (OHASISCost) and “Bilateral Agreements” variable was 0.503 and the correlation between HDI and “Bilateral Agreements” was 0.039.

In a 2SLS FE model using time and Bilateral Agreements as the IV, the effect of OHASIS cost is seen to be significant and positive. Other significant factors using a p-value threshold of 0.05 are Population, GDPPerCapita, the percentage of the population to freshwater (PopWater), and percentage of arable farmland (Farmland). See Table 2.

	Estimate	Std. Error	t-value	Pr(> t)
OHASISCost	1.016e-08	3.793e-09	2.679	0.0083256 **
POPBillions	-6.788e-03	2.497e-02	-0.271	0.7862181
GDPPerCapita	2.251e-05	1.986e-06	11.333	<2.2e-16 ***
EMDATPopPercent	1.298e-01	9.187e-02	1.412	0.1600910
PopWater	2.713e-03	3.208e-04	8.457	4.859e-14 ***
FarmLand	-1.446e-03	3.618e-04	-3.998	0.0001064 ***
TerrorEvents	2.761e-05	4.866e-05	0.567	0.5713534
MCCPerCapita	1.547e-03	1.235e-03	1.251	0.2128734
USAIDPerCapita	-9.241e-04	7.477e-04	-1.235	0.2187243
DefenseTreaties	8.512e-03	5.035e-03	1.690	0.0933275

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2. Summary Results for 2SLS FE Model

1. OLS Model Comparison

To check that the presumed assumption violations were valid, an OLS FE model was run for comparison with the 2SLS FE model. The variable “FiscalYear” was the fixed effect variable for this model as well. The OLS model is shown in Figure 5. As seen in Table 2, using a p-value of 0.05, the OHASIS cost is significant and positive. Other significant factors in the model are Population, GDPPerCapita, and the percentage of the population to freshwater (PopWater), USAIDPerCapita.

$$\text{HDI} = \text{OHASISCost} + \text{POPBillions} + \text{GDPPerCapita} + \text{EMDATPopPercent} + \text{PopWater} + \text{FarmLand} + \text{TerrorEvents} + \text{MCCPerCapita} + \text{USAIDPerCapita} + \text{factor(FiscalYear)} + \mu$$

Figure 5. OLS Model

	Estimate	Std. Error	t-value	Pr(> t)
OHASISCost	5.292e-09	2.277e-09	2.324	0.0216561 *
POPBillions	-1.563e-02	2.395e-02	-0.652	0.5151125
GDPPerCapita	2.165e-05	1.882e-06	11.507	<2.2e-16 ***
EMDATPopPercent	1.578e-01	8.867e-02	1.779	.0774581
PopWater	2.708e-03	3.153e-04	8.588	2.359e-14 ***
FarmLand	-1.230e-03	3.306e-04	3.7219	0.0002933 ***
TerrorEvents	2.073e-05	4.764e-05	0.435	0.6640794
MCCPerCapita	1.607e-03	1.214e-03	1.323	0.1879079
USAIDPerCapita	-9.583e-04	7.346e-04	-1.304	0.1943432
DefenseTreaties	5.955e-03	4.702e-03	1.267	0.2074072

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3. Summary Results for OLS FE Model

C. TESTING FOR ENDOGENEITY

The Durbin- Wu- Hausman test (Staiger & Stock, 1997, p. 567) is the common test for endogeneity between various models. The OLS FE model was compared to the 2SLS FE model. The null hypothesis is the OLS FE model is preferred over the 2SLS FE model. If 0.05 is used as the standard p-value, then the result (p-value = 0.989) concludes that endogeneity is not present and the OLS model is the preferred model to use.

D. SUMMARY

Although endogeneity was assumed to be present in this particular case, the OLS model is preferred. The results also indicate that increased OHASIS expenditures have a positive impact on the HDI. “FarmLand” was a significant factor that had an unusual negative impact on the HDI. Moderate negative correlation occurs between ‘Farmland’ and ‘HDI’, which could indicate that countries with more arable farmland and that were less wealthy would drive other factors in the HDI to become negative. Other significant positive factors include Population, GDPPerCapita, the percentage of the population with access to freshwater (PopWater), and USAIDPerCapita.

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V. SUMMARY, RECOMMENDATIONS, AND FUTURE RESEARCH

A. SUMMARY

The purpose of this study was to provide concrete tools to measure DoD MOE/MOPs for HA missions and to find an effective way to determine if DoD engagement in HA missions is in accordance with the NSS. Chapter II focused on previous academic research concerning 2SLS. Chapter III provided all model variables and descriptive statistics. The final dataset has 147 observations in 23 of the 26 U.S.C. Title X eligible countries using aggregate DoD HA engagement missions from 993 missions in PACOM AOR from 2006–2012. Chapter IV provided model specification and analysis.

Analysis shows that an OLS model is preferred over a 2SLS model for this dataset. The OHASIS cost is significant and positive, which indicates that increased HA costs has a positive impact on the HDI. This suggests that U.S. efforts in HA are associated with improvements the HDI in developing nations. These HA missions in the PACOM AOR fall in line with part of the goals of the NSS, which is for the U.S. to strengthen partnerships and improve the overall state of developing nations.

B. RECOMMENDATIONS

- Although OLS was the preferred model for this research, the presence of endogeneity must be checked due to the selection bias of all DoD HA missions. 2SLS should be the alternative method of choice.
- Factors such as Population, GDPPerCapita, the percentage of the population with access to freshwater (PopWater), and USAIDPerCapita, are significant to the OLS model. These factors could be turned into MOPs for example:
 - PopWater—Increasing HA water sanitation events. Approximately 11% of all recorded missions were exclusively geared towards water/sanitation projects. (See the Appendix)

- Farmland—Changing current HA missions to encourage farmers to grow their own crops or buying local crops rather than shipping food to developing nations might be more beneficial. No specific missions towards relating to arable farmland appeared in the dataset.
- If a DoD funded mission cannot be associated with an MOE, then it should not be completed under DoD purview.
- All OHASIS data were based on estimated costs. Having a way to use the actual costs once the missions were complete would help provide more concrete analysis.
- The formulas used to calculate the HDI could be employed to collect data on certain regions or more local areas to help HA planners gain more insight about the effects of DoD HA with higher resolution than that captured with this thesis research.
- OHASIS data entry needs to improve. Creating “tripwires” that would only allow all funds to be sent to a particular mission after certain parts of OHASIS are verified might help ensure all necessary data is collected, especially after the mission is complete.

C. FURTHER RESEARCH

This thesis was only limited to the PACOM AOR. This methodology could be expanded to all AORs. Also, the dataset contains latitudes and longitudes of HA missions and terror data events. This could be used for spatial correlation analysis. Finally, a more detailed purpose of each of the 993 missions is provided in the dataset with a summary explanation in the Appendix. More country- specific analysis could be completed to help HA planners determine where to maximize DoD’s results.

APPENDIX. FOLLOW-ON RESEARCH INFORMATION

A. LOCATION OF HA EVENTS

Within the 147 observations, out of the 993 events at which HA events occurred, 245 did not have longitude and latitude data points. After reading the detailed description and inputting the city of the particular event, the R package “ggmaps” was used to produce longitude and latitude data from the GTD city/country pairing using Google maps (Rproject.org. n.d.). For events that did not have a specified city in the detailed description, the longitude and latitude of the national capital was used.

B. MISSION TYPE

Four categories of events are available for the HA event planners to select in the OHASIS dataset under the column ‘sector’. (1) education support, (2) health support, (3) basic infrastructure, or (4) disaster mitigation and preparation. For this thesis, all events were categorized into two new categories, health or infrastructure, after a review of each event description. Sixteen subcategories under these events make it easier to determine what type of HA event occurred without having to read each particular event’s description. The subcategories appear in Table 4.

Figures 6 and 7 are pie charts showing the percentages of each type of mission. The majority of DoD HA events are focused on building schools and providing general care to HN citizens. From the events’ descriptions, the reasons given for these two types of events are reduction of terrorist influence in the region and overall increase in human development (Human Development Report Office (HDRO), Human Development Reports, n.d.c.). One hundred thirteen HA events (11% of the total) fell into both health and infrastructure categories.

Event Category	Event Description
Health-Clinic	Overall health care education given to host nation citizens
Health-Dental	Basic dental services were provided to host nation citizens
Health-Disease	Various vaccinations were provided to host nation citizens
Health-Education	Education of host nation health care providers concerning building health care capacity
Health-Excess Property	Excess Health property was given to host national health care facilities to host nation citizens
Health-Eye/Ear Care	General eye/ear checkups and minor surgeries were performed for host nation citizens
Health-General Care	General health care services were provided. Example: minor surgeries. Used to ease backlog of local services that were needed
Health-Vet Services	Veterinary services including animal vaccinations and general care were provided
Infrastructure-Water/Sanitation	Construction/renovation of water sanitation services
Infrastructure-Civic Center	Construction/renovation of civic/multipurpose centers
Infrastructure-Health	Construction/renovation of hospitals/ clinics
Infrastructure-Roads	Construction/renovation of major roads
Infrastructure-School	School construction and/or repairs
Infrastructure-Training	Aided host nation personnel at general infrastructure capacity-building techniques (i.e., Table-Top Exercises)
Infrastructure-Various	Various construction projects were completed. No other specifics given.

Table 4. General Description of Completed Events in OHASIS PACOM Database from 2006—30 APR 13

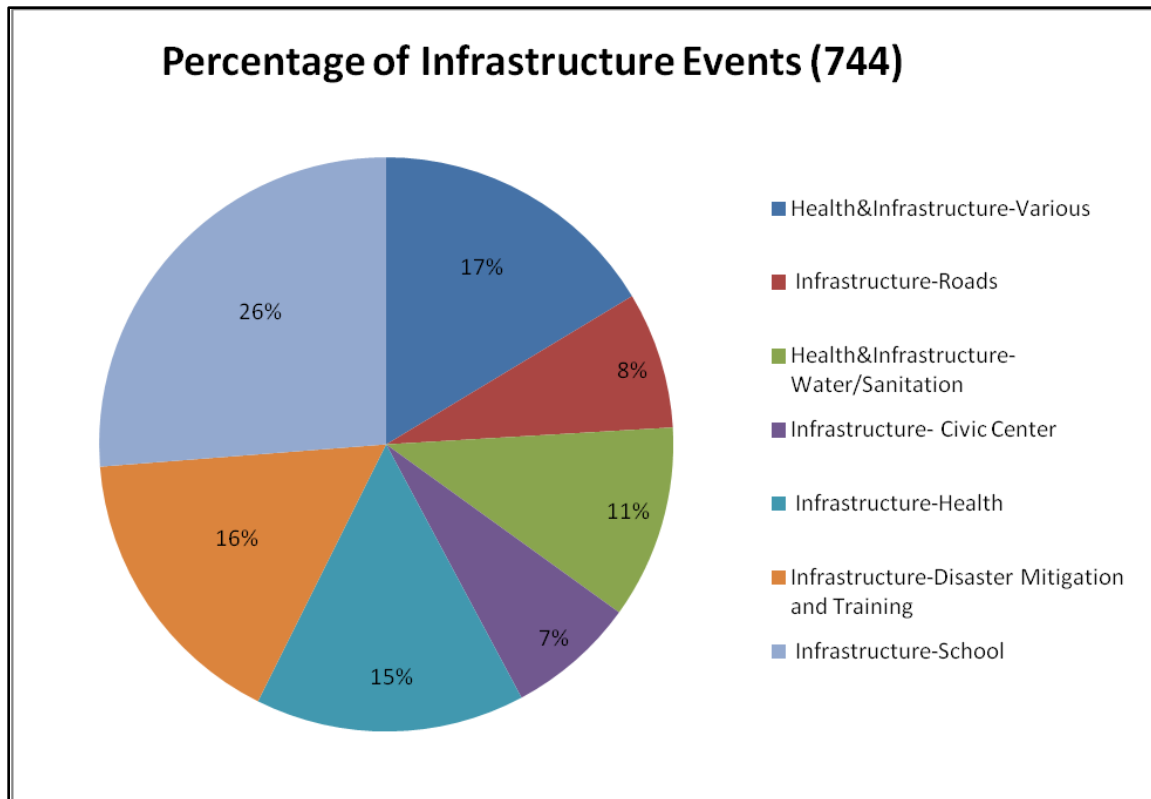


Figure 6. Percentage of Infrastructure Events

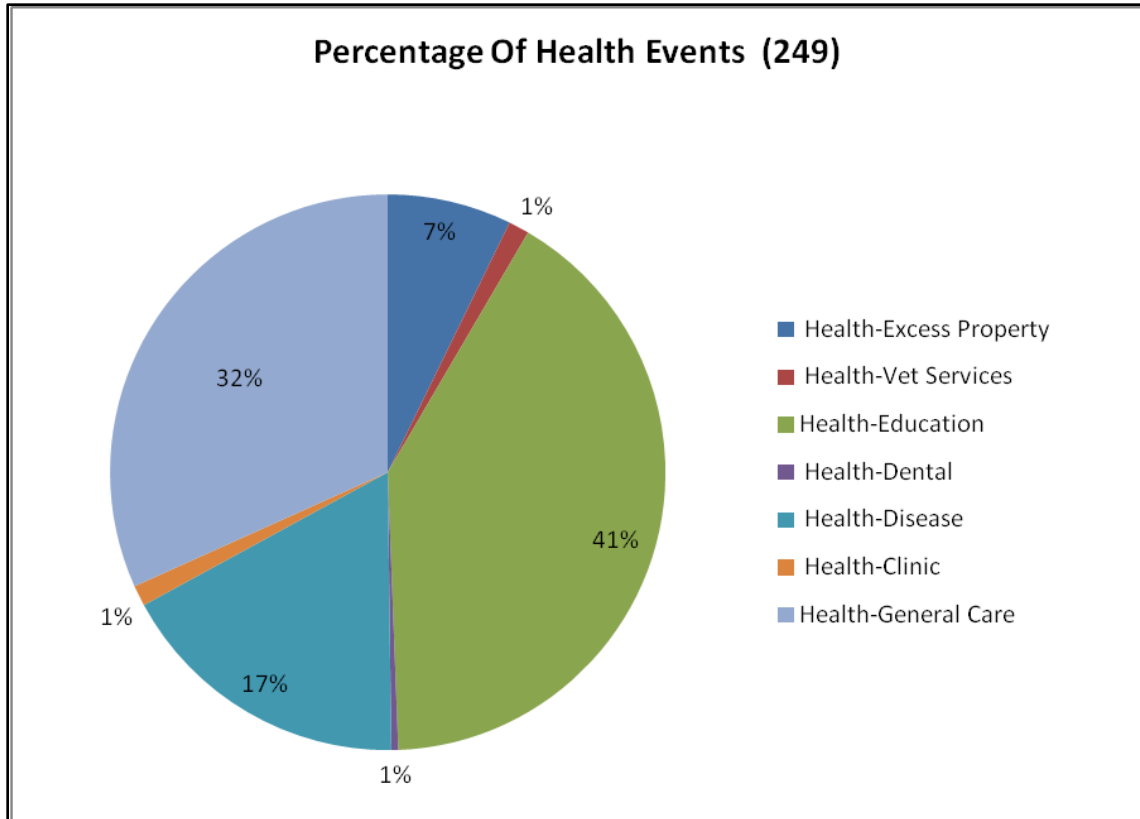


Figure 7. Pie Chart of Health Events

C. TERROR EVENTS

- Determining Longitude and Latitude for Terror Events with HA HN Countries

Of the 104,689 total terror events in the GTD, 6,326 of interest occurred in 12 of the 23 countries of interest. The majority of datapoints did not have the longitude and latitude of the terror events. The columns 'city' and 'country_txt' were combined to see how many of the entries would not have data in any column. All the events had a country datapoint but several had a city missing. The R package 'ggmaps' was used to produce longitude and latitude data from the GTD city/country pairing using Google maps (Rproject.org. n.d.). The HDI index should be positive for countries that have fewer terror incidents.

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